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FORCEnet
Science and Technology

Gary Toth

Information Integration Program Officer

Office of Naval Research

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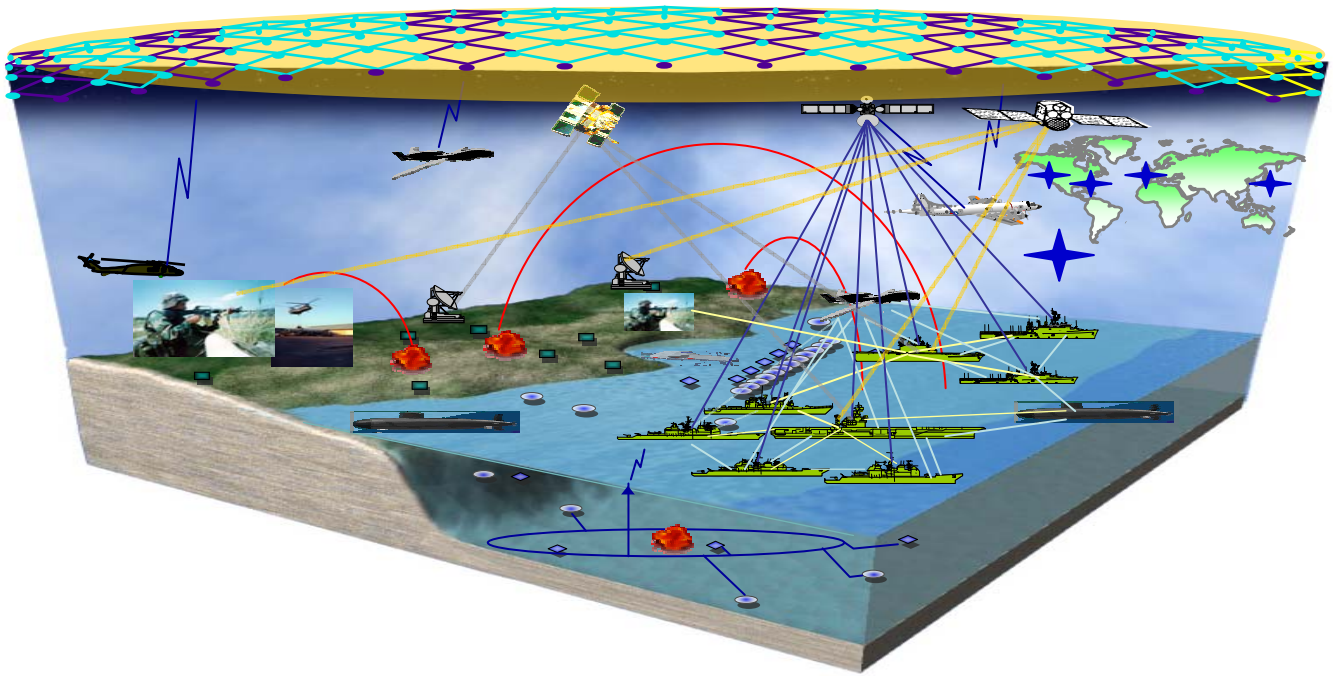
Sponsored by
SPAWARSYSCOM
FORCEnet Chief Engineer

FORCEnet

A construct that integrates sensors, networks, decision aids, weapons and supporting systems into a highly adaptive human-centric comprehensive maritime system that operates from the sea bed to space and from sea to land.



ONR has 3 key FORCEnet technology focus areas:

1) *Rapid, Accurate Decision-Making*

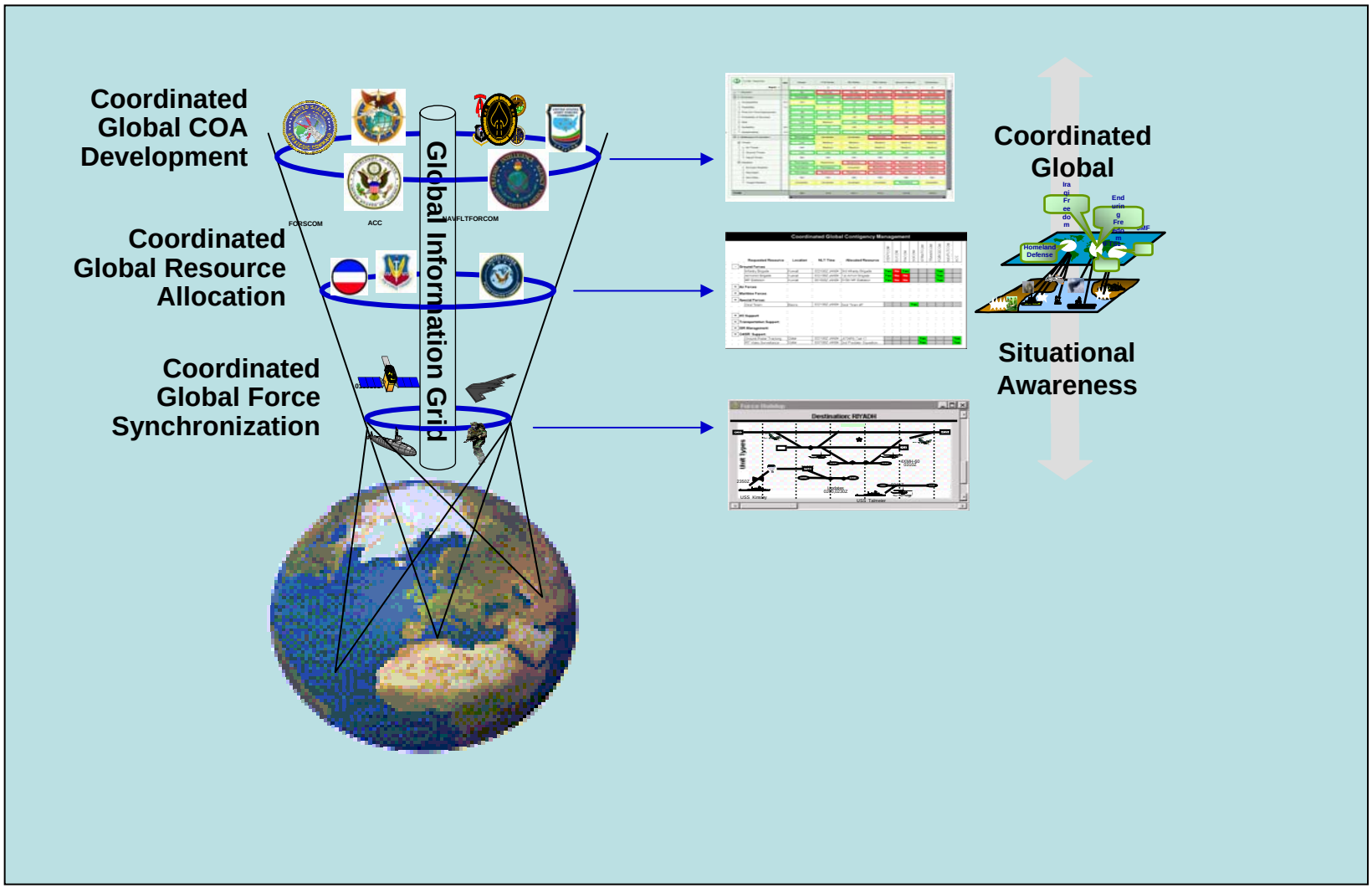
2) *Dynamic, Efficient Mission-Focused Communications and Networks*

3) *Pervasive and Persistent Sensing*

Rapid, Accurate Decision-Making

- Joint Service Oriented Architectures for rapid, interoperable sharing and discovery of mission relevant sensor data and information and joint command and control
- Automated image understanding
- Automated integration of disparate sensors and sources of information including metadata (e.g., information source, quality, validity, integrity, priority, degradation) to produce actionable knowledge
- Automated Courses Of Action with insight into uncertainty and risk particularly for specific scenarios such as urban, guerilla, and terrorist activities and port / force / base protection
- Highly flexible means of presenting complex information including uncertainty, geo-spatial, etc from multiple relevant data sources for aiding in assessing intent as well as situation awareness while performing mission
- Ensure authenticity of information from enclaves and prevent unauthorized transmission of information
- Multiple levels of security
- Assured access to networked information stores across the GIG

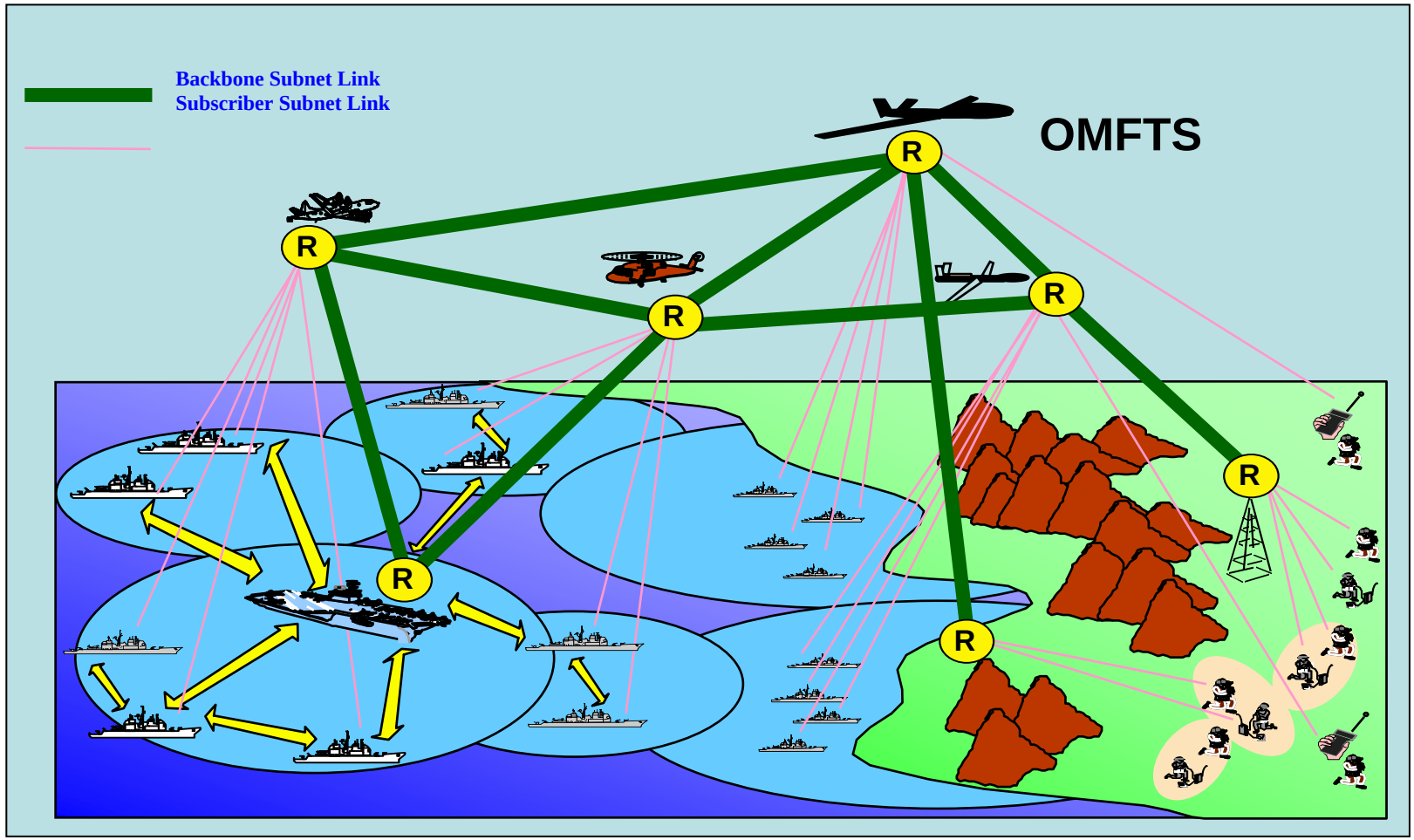
Joint Coordinated Real-time Engagement (JCRE)



Dynamic, Efficient Mission-Focused Communications and Networks

- Protocols and architectures for dynamic, mobile naval forces where COTS fails
- Mission-driven quality-of-service capability
- Automation tools for communications and network management which optimize for battle-space situation, battle-space environment, and commander's intent
- Robust over-the-horizon connectivity
- Advanced aperture and radio technologies to ensure continuous platform participation in the network
- Concepts for enhancing underwater communications and for rapidly moving underwater sensor information and data into overall common picture database
- Real-time multi-level secure chat for rapid compartmentalized communications supporting multiple concurrent sessions used for Fleet, joint, and coalition operations and usable in bandwidth limited situations
- Improved access control locally and over networks
- Extensible security system for network component configuration monitoring, response, and policy enforcement at network boundary control

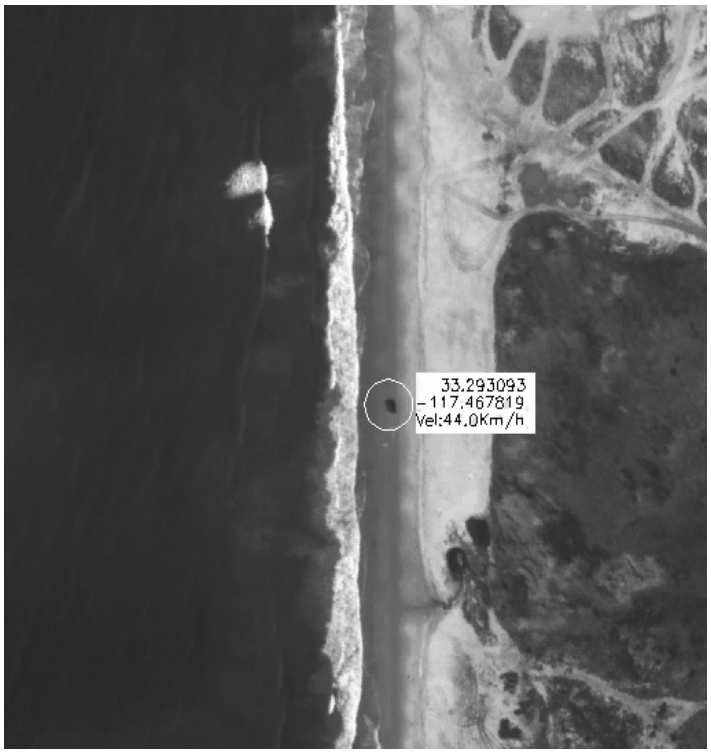
Intra Battle Group Wireless Networking (IBGWN Block I&II)

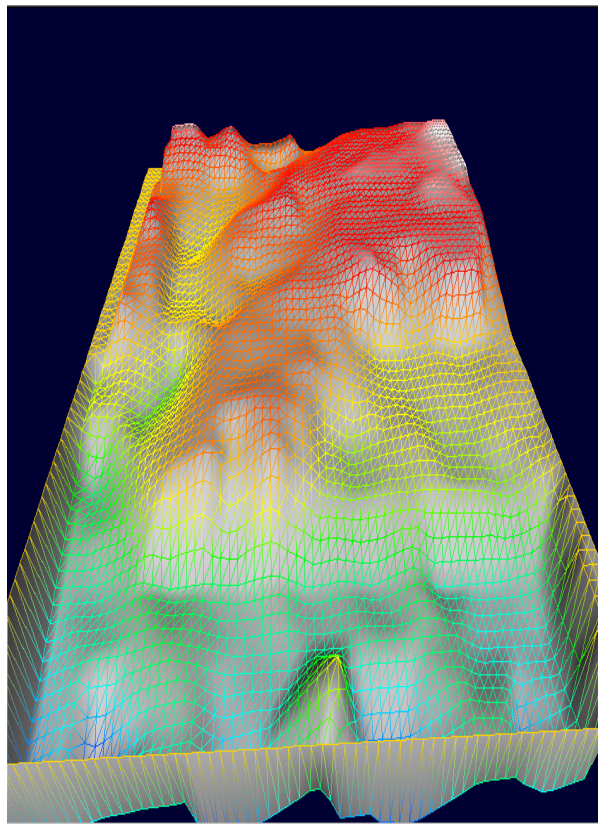


Pervasive and Persistent Sensing

- Advanced light-weight, small, efficient sensors for variety of platforms (video, IR, SAR, chem/bio, etc)
  - Flexibility in search / ID
  - Multi-modal
- Automated processing at sensors and sensor networks (triage, assessment, and control)
- Integrated modules including on-board processing and control
- Automated self-control and self-tasking of sensors and sensor networks including optimization of resources and COTP development
- Four-dimensional navigation data with and without GPS
  - Jam-Resistant GPS navigation
  - Non-GPS navigation

Tactical Littoral Sensing

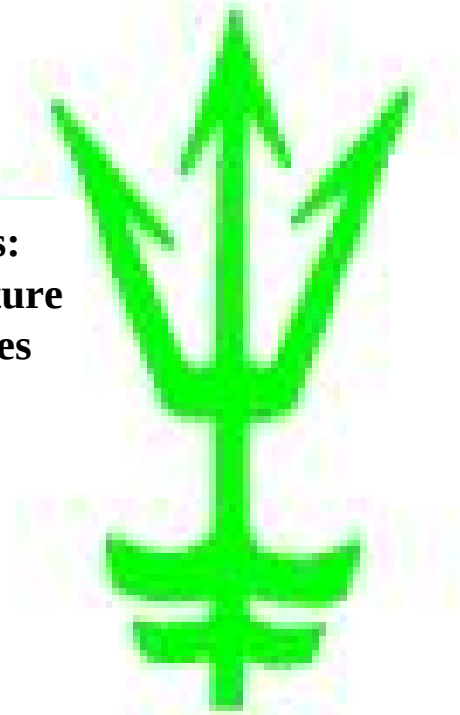




A "Trident" Strategy for S&T Investment

Pursue Current and Emerging State-of-the-Shelf and State-of-the-Art Technologies That Can Enhance Mission and Functional Capabilities in the Domain-Centric, and Network-Centric Environments: D&I Program

Address Near Term Enhancements in Specific Mission and Function Areas: FNCs, Implementation of Mature State-of-the-Shelf Capabilities



Address the Limitations in Key Enablers of NCW That Will Require a Concerted Naval Investment: D&I Program

S&T Partners

- **Common Operational Picture**:
  - Partnering with DARPA on FAST2CAP initiative to develop agent technology for improved Maritime Domain Awareness
  - Army Research Institute for collaborative work on Virtual Reality interfaces
  - Extensible Tactical C4I Framework/Extensible Common Picture (XTCF/XCOP) – DISA/OSD NII/CIO Horizontal Fusion OSD
  - Joint Real Time Coordination Engagement (JCRE) ACTD – DISA
  - Commander in Chief- 21st Century (CINC 21) ACTD – STRATCOM/DISA
  - Environmental Visualization (EVIS) – DISA/Horizontal Fusion OSD
  - Comprehensive, Analytic, Real-Time Execution (CARTE) – CACE ACTD and co-development with MARCORSYSCOM PM CASE
  - Co-develop enhanced visual pattern recognition for light artillery detection in urban clutter with DARPA

S&T Partners

- **Comms & Networks**:
  - MOU with AFRL, and ARL to support collaborative work on steganography (financial support received from CIA)
  - PEO C4I and NSA (RDT&E funding to help transition S&T technology for example Programmable Embedded INFOSEC Product Module (PEIP))
  - High Altitude Relay & Router – USAF Space BattleLab/AFRL Hi-Alt Balloon Lab
  - DARPA for Onion Routing and other technology
  - Multi-National Virtual Operations Capability (MNVOC) – Coalition Partners
- **ISR**
  - **Global Positioning System (GPS) and Navigation**
    - Collaboration with GPS JPO to develop GPSIII YMCA Code
    - Collaboration with GPS JPO to develop GPSIII Fast M-code Acquisition
    - Partnership with AFRL for their SIRIAS Project to evaluate the next GPS AJ Antenna
    - Collaboration with AFRL to develop a Rubidium Clock Module (RCM) for F-15 EGI system

S&T Leverage

- **Common Operational Picture:**
  - USAF/USA/NRO/USN TENCAP Radiant Gemstone initiative
  - Leveraging NSA/NRO/USA/USMC investment in collection hardware in SLY FOX and database toolkits
  - Composable FORCEnet enabling Services leveraging DARPA Rapid Knowledge Formation and Control of Agent-Based Systems effort
- **Comms & Networks:**
  - Leveraging Army Future Combat System QoS development with Boeing, and Internal Research and Development by Boeing and Cisco
  - Conformal Antennas from DARPA Meta-Materials
  - Network Management from DARPA Control of Agent-Based Systems
  - Network Mobility from DARPA Onboard Switch Using Directional Antennas for Ad-Hoc Networks

S&T Leverage

- **ISR:**
  - Rapid Maritime Identification and Tracking System (RMITS) is leveraging biometric database and interfaces developed by the OSD Biometrics Tech Office for FBI fingerprint analyses in support of maritime interdiction operations
  - Analytic Support Architecture (ASA) leverages previous NRO/USAF investments in developing multi-INT data fusion algorithms
  - Comprehensive, Analytic, Real-Time Execution (CARTE) extends the CACE ACTD in applying optimization algorithms to a wider class of aircraft including the Joint Strike Fighter.
  - USMC leverages DARPA/USA investments in unattended sensors
- **GPS and Navigation:**
  - 4-Channel Space-Time Adaptive Processing (STAP) Application to GPS AJ Antenna developed by AFRL
  - Precision Underwater Mapping (PUMA) Bathymetric Navigation Aids – leveraging previous NAVSEA/University of Texas, Austin
  - GPS-JTIDS Rel Navigation with MIDS/JTIDS – leveraging flight tests at NAVAIR PAX River by SPAWAR PMW-159

Today

- Recognizing the shift in warfighter environment
  - Refocus to address Global War On Terrorism (GWOT) and urban asymmetric operations
  - Develop multi-sensor data fusion (level 2/3) to combine information from multiple sources and sensors including human and contextual information to achieve inferences not feasible from a single sensor or source

Future Focus

- **FY06 and Beyond — Focusing on PR-07 Requirements**
  - ISR Image Processing: Assisted Target Recognition; Auto Registration; GPS Geo-Coordinate Generation
  - ISR Fusion: Multi-INT Fusion; Cross-cueing
  - Maritime Domain Awareness: Automated Tracking Tools; Sensor Fusion; World-Wide Data Sharing
  - Comms and Networking: Message Prioritization; Encryption Packaging; Load Balancing
  - GPS: Directional Nulling; Miniaturization of Antenna Elements; Precision Timing
  - Intelligence Preparation of the Environment: Level 1 Fusion; High Fidelity Sensors; Data Translation to Tactical Info
  - COTP: Fused Intelligence; Accurate Data Mining; Cognitive Displays

Network Centric Warfare is the Theory.
Network Centric Operations is the Concept.
FORCEnet is the process of making the theory and concept a reality.

ONR Programs are on the leading edge of new technology, making information into power.